1.85

Published about 1730

A
SCHEME
For a COURSE of
CHYMISTRY,
To be PERFORMED by

HENRY PEMBERTON, M. D.

Profeſſor of PHYSICK in GRESHAM-COLLEGE,
and Fellow of the ROYAL SOCIETY.

ARMY MEDICAL LIBRARY
WASHINGTON, D. C. U. S.
590

THIS COURSE is to begin as ſoon as Fifteen ſhall have ſubſcribed, and to be continued every *Monday*, *Wedneſday*, and *Friday*, till it is finiſhed.

THE terms to the ſubſcribers are Four *Guineas*, one to be paid at the time of ſubſcribing, the reſt on the day the Courſe begins ; and thoſe who attend this Courſe, are free to be preſent at any other *gratis*, after having paid one *Guinea* more at the ſecond Courſe.

A SCHEME For a COURSE of CHYMISTRY.

THE deſign of this courſe is, in the firſt place, to perform the ſeveral operations of chymiſtry; both in preparing all the chymical medicines now in uſe; and alſo in the ſmelting, refining, and ſuch like proceſſes on metals; together with other operations in thoſe trades or employments, which depend upon the principles of chymiſtry.

IT is propoſed, in the ſecond place, to deſcribe in the plaineſt and fulleſt manner the method of proceeding in each operation, and to deliver all the cautions neceſſary to be obſerved in them.

IN the laſt place, it is intended to have a particular regard to the uſe of chymiſtry in natural philoſophy. The proceſſes are diſpoſed in ſuch an order, as may be moſt conducive towards ſhewing the reaſon and true effects of each operation; and all the diſcoveries, which have hitherto been made in

A 2

402995

in nature by chymiſtry, will be particularly explained, together with ſome attempts towards farther advances.

In the progreſs of theſe experiments will be given an account of the eſſential difference between animal, vegetable, and mineral ſubſtances; of the nature of nutrition, vinous fermentation, and putrefaction; of the nature and different operations of menſtruums, wherewith bodies are diſſolved; of the nature and operations of the air, how aqueous vapours and clouds are ſuſpended in it, by what means it cauſes bodies to burn, and why it is preyed upon by them in burning; how air is generated in fermentations and diſtillations.

In general, it will be ſhewn to what principle bodies owe the conſervation of their diſtinct forms, and what powers procure the natural changes, whereby the face of nature is perpetually varied and renewed.

The ſubject of each lecture follows.

Lecture I.

The threefold deſign of chymiſtry; the production of metals, the improvement of medicine, and of natural philoſophy. The riſe and progreſs of the art. The nature of heat explained upon Sir Iſaac Newton's principles, and illuſtrated by experiment.

LECTURE II.

CONCERNING volatility and fixity. Of the difference between diſtillation and ſublimation, with the inſtruments of each. Of digeſtion, and its inſtruments. The inſtruments for melting and calcining. Of lutes, and hermetical ſealing, with the method of cutting off the ſuperfluous parts from glaſſes. The various kinds of heat; that of water, of ſand, the open fire, and the two kinds of the reverberatory fire, with the furnaces for each of theſe heats; alſo the blaſt, and wind furnaces; as likewiſe the athanor and extempore furnaces. Of the ſeveral ſorts of fuel. Of clays and bricks; particularly Windſor bricks and loam, and the Stourbridge clay. Of the ſeveral ſorts of weights.

LECTURE III.

OF the chymical principles. Of water; why it dilates in freezing; experiments with freezing mixtures, and the cauſe of their operation. Of ſalts and ſpirits; the acid, alkaline, and neutral; the criterions, whereby to diſtinguiſh acids and alkalis. Of oils and their inflammability: burning conſidered, with the office of the air in it, and why water extinguiſhes fire. Of the aerial vapour ſeparable from bodies in diſtillation.

LECTURE IV.

ANIMAL and vegetable ſubſtances diſtilled; all of the animal and ſome of the vegetable, ſhewn to produce an alkaline ſpirit and ſalt beſides an oil; the reſt of the vegetables ſhewn to contain an acid ſpirit and another oil; all leaving a black coal. Milk and urine conſidered particularly: why milk is uſeful in hectic fevers; and experiments made with the phoſphorus of urine.

LECTURE V.

THE purification and analyſis of the ſalts, ſpirits, and oils of the preceding lecture. How oils are ſeparated from watry liquors. An example of the diſtillation of the natural balſams in turpentine; whence roſin, both yellow and black: how turpentine is gathered, and how tar and pitch are made. Eſſential oils diſtilled, and flowers of benjamin ſublimed, alſo camphire: why theſe oils and reſines riſe ſo freely, while other oils, lighter than ſeveral of theſe, can be obtained only by expreſſion. The uſe of the cold ſtill.

LECTURE VI.

ON fermentation and putrefaction. What relation ſweetneſs bears to vegetable fermentation: here ſugar diſtilled: fermentation deſcribed in its whole progreſs to the making firſt of wine, then of vinegar; and the nature

ture of this operation inquired into: the inflammable ſpirit diſtilled from wine, and farther purified; vinegar alſo diſtilled: the original of tartar, and other eſſential ſalts: tartar purified into cremor tartari, alſo diſtilled. The effects of putrefaction; whence animal digeſtion explained.

LECTURE VII.

THE effects of burning animal and vegetable ſubſtances in the open air: the fixt alkaline ſalt of vegetables prepared; how pot aſhes and pearl aſhes are made: ſoot diſtilled. How the aerial vapour ariſing from animal and vegetable ſubſtances in diſtillation is to be collected.

LECTURE VIII.

CONCERNING menſtruums: their action explained; why heat promotes it: experiments on the heat and cold produced in diſſolutions, and the cauſe thereof conſidered: concerning precipitation. Compoſitions from the productions of the preceding lectures: fixt alkaline ſalt run per deliquium: ſpirit of wine rectified by theſe ſalts: theſe ſalts fermented with the vegetable acid of vinegar and of tartar: ſoaps a compoſition of theſe ſalts and oils; here ſapo tartareus: why theſe ſalts cauſe a ſudden ſeparation of the volatile ſalt from freſh urine: ſpirit of wine tinctured by theſe ſalts: tinctures drawn from vegetables by wine and its ſpirit; here extracts and reſines: how tinctures are aſſiſted by fixt alkaline ſalt, particularly in myrrh: the volatile animal ſalt purified by ſpirit of wine: the luminous part of the phoſphorus imbibed by this ſpirit, and the body of the phoſphorus diſſolved by eſſential oils: tinctures extracted by vinegar; and its acid converting earthy ſubſtances into a ſalt.

LECTURE IX.

OF the mineral ſalts, ſea ſalt, nitre or ſalt-petre, alum, vitriol, and borax: their cryſtallization; and the different figures, into which ſalts ſhoot, conſidered: ſea ſalt and nitre diſtilled with earth: the detonation of nitre, and the nature of the fixt alkaline ſalt of vegetables from hence farther explained: the calcination of alum and vitriol; from the latter ſal vitrioli: alum and vitriol diſtilled, both before and after calcination; together with the rectification of their acid ſpirits, whence ſpiritus & oleum vitrioli: the diſtillation of borax. How each of theſe ſalts is obtained.

LECTURE X.

THE acid ſpirits of the preceding lecture fermented with the fixt alkaline ſalt of vegetables, with an account of the ſalts thence produced: the like experiments with the volatile alkali: here the compoſition of ſal ammoniac, with its ſublimation: the earthy part of all the mineral ſalts, except nitre, precipitated by alkaline ſalts; whence ſome light into the nature of nitre: the fixt alkali more powerful than the volatile; hence the decompoſition of ſal ammoniac by a fixt alkaline ſalt, the purification of animal ſalts by ſpirit of ſea ſalt, ſalia volatilia oleoſa. The nature of the pigments made with alum: the Pruſſian blue here prepared, and ſhewn why a large quantity of this coloured terreſtrious ſubſtance is produced from two tranſparent liquors: the uſe of alum in dying. Homberg's phoſphorus made. That the acid ſpirits diſpoſſeſs one another: hence aqua regia by adding common ſalt or ſal ammoniac to ſpirit of nitre; and the ſpirits of ſea ſalt and of nitre extracted by oil of vitriol, whence Glauber's ſpirits of ſalt and of nitre; and by vitriol itſelf, whence common aqua fortis. The uſe of aqua fortis in dying ſcarlet. Why Glauber's ſpirits of ſalt and of nitre, as alſo aqua fortis, ſmoke inceſſantly; and why oil of vitriol expoſed to the air increaſes in bulk. Here occaſionally how vapours are drawn into the air, and why condenſed above into clouds. The acid ſpirits dulcified by ſpirit of wine; and their effects on oils and camphire: here explained why ſpirit of wine reſtrains the fermentation of vinous liquors, and why the ſerum of the blood is coagulated by heat. The ſudden

den inflammability of Glauber's ſpirit of nitre with certain oils: hence the effects of the phoſphori explained, and what part of the air aids the burning of bodies.

LECTURE XI.

OF mineral ſulphurs. Whence common brimſtone obtained: here general definition of ſpars, and of mundics otherwiſe called pyrites and marcaſites: common brimſtone decompounded; whence oleum ſulphuris per campanam, and gas ſulphuris: why the ſmoke of brimſtone checks vegetable fermentation: how bitumina differ from ſulphur: ſulphur not to be analyſed by ſimple heat, but ſublimes intire into flowers: ſulphur diſſolved in oils, and, by the help of fixt alkaline ſalt, in water, and gives a tincture, by the ſame means, to ſpirit of wine: ſulphur fulminated with nitre; whence ſal prunellæ, and ſal polycreſtus: the compoſition of gunpowder, and of pulvis fulminans; why pulvis fulminans explodes in the open air more vehemently than gunpowder; why gunpowder muſt be corned to make exploſion; the general ſtructure of rockets, bombs, granadoes, and other fireworks, with the reaſon of their effects. Orpiment here conſidered, and that ambiguous ſubſtance ambar.

LECTURE XII.

ON ſtones. What ſtones make glaſs: how glaſs is made from ſtones or ſand: why glaſs, when melted, is wrought by blowing, whereas melted metals are caſt in a mold. On lime: aqua calcis: the acrimony of fixt alkaline ſalts improved by lime into a cauſtic in the preparation of the lapis infernalis: the action of lime on freſh urine, and on ſal ammoniac, whence ſpiritus ſalis ammoniaci cum calce: the uſe of lime in making ſoap; in preparing and refining ſugar: ſulphur diſſolved by lime, whence lac ſulphuris: Mr. Boyle's fuming liquor with ſulphur, lime, and ſal ammoniac: ſympathetic ink with lime and orpiment: laſtly, the phoſphorus Balduini.

LECTURE XIII.

METALLURGY begun. An account of the gold and ſilver ores of America, of the gold ſands of Africa, and how the metal is there extracted: how the ſame metals are obtained in Europe: on the ore of quickſilver, in particular native cinnabar: how lead, tin, copper, and iron are ſeparated from their ores by charcoal: how lead, tin, and copper are ſeparated by pit-coal. Models ſhewn of the ſeveral furnaces. How eſſays are made, with the nature of the two kinds of flux-powders.

LECTURE XIV.

THE calcination of the metals. How lead, tin, copper, iron, and quick-ſilver are calcined by our fires; whence from iron crocus Martis aſtringens, from quick-ſilver Mercurius præcipitatus per ſe; from lead minium, litharge, and vitrum Saturni; from lead and tin together the powder, wherewith metals are poliſhed, called putty, but not the putty of the glaziers, which is here alſo occaſionally deſcribed: here the manner of glazing earthen ware; of what conſiſt the red, white, and black glazing: flint-glaſs deſcribed. That all metals are calcined by the burning glaſs, and the particular phænomena of that calcination enumerated. How calcined metals may be reſtored. The cauſe of calcination, and of ſuch reſtitution.

LECTURE XV.

OF refining, ſeparating, and other preparations of metals. How ſilver is ſeparated from lead, and how refined by that means; how this ſeparation is performed at the mines, how by the refiners, and how in eſſays: occaſionally how the refiners melt what they call their ſweep: how ſilver is ſeparated from copper in Germany, ſo as to preſerve both metals. Braſs and ſteel made.

LECTURE XVI.

OF the imperfect metals. How biſmuth is melted from its ore. How ſpelter is produced. The production of antimony and operations upon it: vitrum antimonii: diaphoretic antimony prepared, and reduced to regulus: crocus metallorum, and vinum benedictum: regulus antimonii per ſe, cum tartaro & nitro; martialis, & ſtellatus: from the ſcoriæ ſulphur auratum. On arſenic, zaphor, and ſmalt. On the mineral called black lead.

LECTURE XVII.

OPERATIONS on metals. Steel hardened, and tempered. Why ſilver and gold are allayed: an account of our preſent ſtandard, with the changes it has undergone. Other mixtures; whence bell-metal, cannon-metal, the metal of organ pipes, pot-metal, bronzes of all kinds, bath-metal, pewter, ſolders of all kinds; by what artifice the ſolders are made to join to the metals; how iron and copper are tinned, and how ſilver wire is gilt: amalgamas; how glaſſes are foiled with quick-ſilver, and how water-gilding is performed.

LECTURE XVIII.

THE action of the acid ſpirits on metals, with their different ways of operation, ſometimes corroding the metals into powder only, ſometimes diſſolving and converting them into a ſalt capable of cryſtallization; precipitation of diſſolved metals: whence the air or vapour, here produced, is generated. By the acid ſpirits of nitre and ſea ſalt all the metals diſſolved: whence cauſticum lunare; luna cornea; ſal Martis Bat. Mercurius præcipitatus ruber, & albus. Mercurius ſublimatus corroſivus & dulcis, with the reaſon for this dulcification, and other philoſophical remarks on theſe two ſubſtances: here Mr. Boyle's perpetually fuming liquor from tin and ſublimate: laſtly, flores ſalis ammoniaci Martiales, ens Veneris, and aurum Moſaicum: alſo gold refined from ſilver, and aurum fulminans. By oil of vitriol, ſal Martis, and turbith mineral. The metals corroded by ſulphur; whence factitious cinnabar, æthiops mineral, chalybs cum ſulphure præparatus, and crocus Martis aperiens. By vinegar ſaccharum Saturni, white lead, ſal Jovis, chalybs cum aceto. With the acid of tartar chalybs tartarizatus of Bates, and Helvetius's ſtyptic. Action of the acid ſpirits on the imperfect metals: whence magiſterium biſmuthi; butyrum & cinnabaris antimonii, Mercurius vitæ, ſpiritus nitri bezoardicus. The effects of the alkaline ſalts on metals; whence aqua ſapphirrina, & chalybs ſine acido.

LECTURE XIX.

GENERAL remarks on the foregoing proceſſes; whereby it is ſhewn, that the repulſive force ſeen in nature is owing to ſulphur, the attractive to the acid; and conſequently, that the acid principle unites the parts of bodies, and preſerves to each its reſpective form; unleſs an external acid is applied to the body under circumſtances, whereby the body is broken, and a new compound ſucceeds. The nature of the air farther explain'd: that the air cauſes bodies to burn by the ſame principle as acid ſpirits corrode metals, and other terreſtrious bodies.

THE lecture concludes with ſome obſervations on colours, with the method of tinging glaſs, and dying cloth; alſo an explanation of the nature of mineral waters.